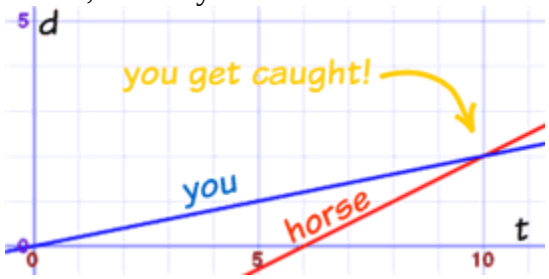
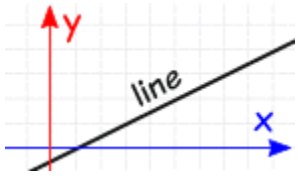
linear equations

- A Linear Equation is an **equation** for a **line**.
- A **System** of Equations is when we have **two or more equations** working together.
- Example:

It's a race!
You can run **0.2 km** every minute.
The Horse can run **0.5 km** every minute. But it takes 6 minutes to saddle the horse.
How far can you get before the horse catches you?
We can make **two** equations (**d**=distance in km, **t**=time in minutes):
= You: d = 0.2t
= The Horse: d = 0.5(t-6)
So we have a **system** of equations, and they are **linear**:



- It seems you get caught after 10 minutes ... you only got 2 km away.
- A **Linear Equation** can be in 2 dimensions ... (such as **x** and **y**)



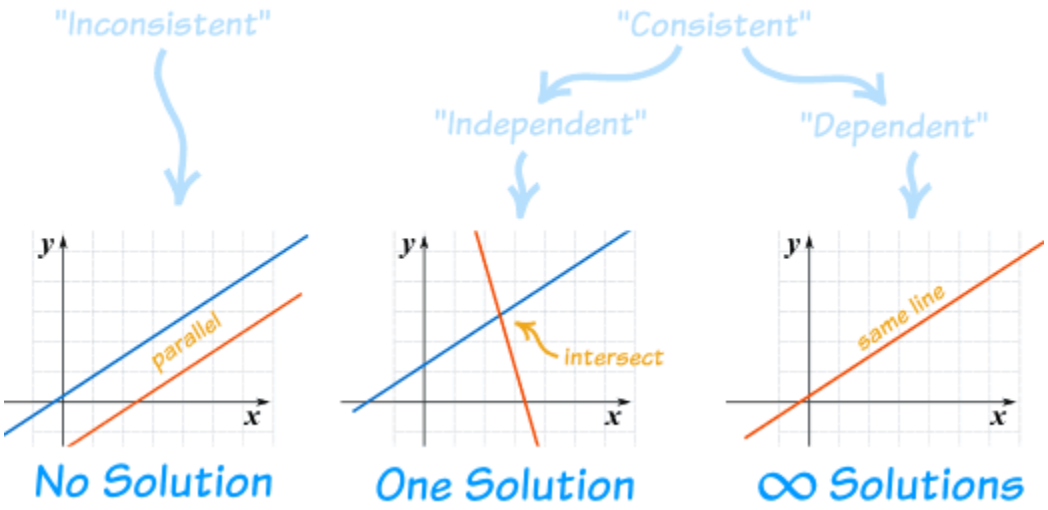
- But a **Linear** Equation has **no exponent** on a variable:

- For the equations to "work together" they share one or more variables: A System of Equations has **two or more equations** in **one or more variables**
- **Example: 3 equations in 3 variables**
- **2x + y - 2z = 3**
- **x - y - z = 0**
- **x + y + 3z = 12**

- **When the number of equations is the same as the number of variables there is likely to be a solution. Not guaranteed, but likely.**

In fact there are only three possible cases:

- **No** solution
- **One** solution
- **Infinitely many** solutions
- When there is **no solution** the equations are called **"inconsistent"**.
- **One** or **infinitely many solutions** are called **"consistent"**



- **"Independent"** means that each equation gives new information. Otherwise they are**"Dependent"**.
- Example:
  - x + y = 3
  - 2x + 2y = 6
  - Those equations are **"Dependent"**, because they are really the **same equation**, just multiplied by 2.
    So the second equation gave **no new information**.